

REMARKS

1. Claims 47-49, 52-53, 55-57, 60-63, 70-71, 73-76 were rejected under 35 U.S.C. 102(b) over U.S. patent no. 6,165,885 to Gaynes et al. Claims 50-51, 58-59, 64-69, 72 were rejected under 35 U.S.C. 103(a) over Gaynes et al. in view of U.S. patent no. 6,190,940 to DeFelice et al.

2. Claims 47-48 depend from Claim 49. Claim 49 recites:

forming one or more conductive contact pads [e.g. 350 in Fig. 16A]
... at a top surface of the first substrate;

forming dielectric [110.3 in Figs. 16A, 18] ... having one or more openings [210B] which overlie the contact pads [350] and also overlie one or more regions adjacent to the contact pads; ...

heating the solder paste in the one or more openings to melt the solder [930] and to solder one or more contact pads [340] of a second substrate to the one or more contact pads of the first substrate ..., the dielectric being present over the top surface of the first substrate during soldering [in Fig. 16A, dielectric 110.3 remains in place even after soldering].

Some advantages of the embodiment of Fig. 16A are discussed in the specification, page 19, paragraph 0085. Claim 49 is not limited to the embodiments or advantages discussed herein, including the embodiments referred to in the brackets above.

Gaynes' Figs. 76, 77, cited by the examiner, teach the following sequence:

- depositing solder paste 1507 to fill the holes 1513 in stencil 1505 and to contact conductive pads 1503 (column 44, lines 53-57);
- heating the solder paste to form solder balls 1509 (column 44, lines 56-60);
- peeling away the stencil 1505 for later re-use on another component (column 44, lines 62-65).

Thus, even if Gaynes' pads 1503 were soldered to another substrate as taught by DeFelice, the stencil 1505 would not be "present over the top surface of the first substrate during soldering" as recited in Claim 49 because stencil 1505 would have to be peeled away before the soldering operation. Indeed, if stencil 1505 were not peeled away before

soldering, the stencil would have to be removed after soldering, and Gaynes and DeFelice do not provide a way to remove the stencil 1505 after soldering to be able to re-use the stencil on another component as intended by Gaynes. MPEP 2143.01, sub-section V states, “THE PROPOSED MODIFICATION CANNOT RENDER THE PRIOR ART UNSATISFACTORY FOR ITS INTENDED PURPOSE”. Therefore, a combination of Gaynes and DeFelice is improper if it renders Gaynes’s process unsatisfactory for the purpose of re-using Gaynes’ stencil on another component.

In addition, DeFelice teaches away from dielectric openings **overlying a contact pad and an adjacent area** as recited in Claim 49. DeFelice’s epoxy 23 (Fig. 5) does not overlie an adjacent area, and DeFelice states in column 6, lines 1-8:

... the epoxy layer 23 ... serves not only to define the perimeter of the solder paste ... but also to **confine ... the reflowed solder** during the reflow step represented by FIG. 6. As a consequence, the solder bumps can be more closely spaced, and solder bump bonding becomes more effective at pitches smaller than would be otherwise used.

Thus, confining the molten, reflowed solder with epoxy 23 is DeFelice’s intended purpose, and DeFelice does not teach or suggest that if his openings were enlarged to overlie an adjacent area as in Claim 49 or in Gaynes, the epoxy 23 would still be effective in confining the reflowed solder.

The importance of confining the molten solder during reflow is emphasized by DeFelice throughout his disclosure. In the Background section, DeFelice laments that the “surface tension” is insufficient to confine the solder, resulting in the solder bumps bridging together (column 2, line 63 through column 3, line 4). In addition, as described in DeFelice’s column 6, lines 17-23, the solder heating step can be used to cure the epoxy, and therefore could be “substantially longer” than conventional. The longer heating step makes it especially desirable “to have the epoxy confining layer present to retain the molten solder”. See also DeFelice’s column 7, lines 20-22 (“According to the invention the outflow of the solder ... is confined by the epoxy layer”). DeFelice thus strongly discourages one skilled in the art from increasing the opening size to cover an adjacent area as recited in Claim 49.

Moreover, in Gaynes’ Fig. 77, the openings in stencil 1505 are larger than the solder balls 1509, and there is no indication that the stencil 1505 confines the reflowed solder as

intended by DeFelice. Gaynes therefore also teaches away from enlarging DeFelice's openings in epoxy 23 to cover an adjacent area because Gaynes suggests that such enlarged openings would make epoxy 23 ineffective in confining the molten solder as intended by DeFelice.

Claims 51-53 depend from Claim 49.

Claims 55-57, 59-69 are believed to be allowable for reasons similar to the reasons given above for Claim 49.

3. Claim 70 recites:

... a top surface of each of the contact pads [e.g. 350 in Fig. 17] comprises a first conductive portion [910.2] and a second conductive portion [910.1] less solder wettable than the first conductive portion [page 19, lines 17-18]; and

... the one or more openings **overlie both the first and the second conductive portions** ...

Some advantages of the structure of Fig. 17 are described in the specification, page 19, paragraph 0085. Claim 70 is not limited to the embodiments or advantages discussed herein, including the embodiments referred to in the brackets above.

The examiner refers to Gaynes' "figures 76-77 and column 44, lines 30-61". Gaynes states in column 44, lines 33-36, that the conductive pads 1503 "may be of any conductive material but are preferably a solder wettable metal such as copper, gold, or tin." Gaynes thus teaches using one of a number of materials for a pad 1503, but does not teach or suggest combining different materials, having different solder wettability, in a top surface of one pad 1503 as recited in Claim 70 (in which "a top surface of each of the contact pads comprises a first conductive portion and a second conductive portion..."). Nor does Gaynes provide any motivation for combining different materials as in Claim 70.

Claims 71-78 depend from Claim 70. In addition, Claim 78 is believed to be allowable for reasons similar to the reasons given above for Claim 49.

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Any questions regarding this case can be addressed to the undersigned at the telephone number below.

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